Fort Detrick and National Interagency Confederation for Biological Research (NICBR)

# NIH Office of Science Education

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## Director

# Workforce of the Future:
## The Way Forward

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# Competitiveness

- "And to keep America competitive, one commitment is necessary above all: We must continue to lead the world in human talent and creativity. Our greatest advantage in the world has always been our educated, hardworking, ambitious people -- and we're going to keep that edge. Tonight I announce an *American Competitiveness Initiative*, to encourage innovation throughout our economy, and to give our nation's children a firm grounding in math and science."

  - **President George W. Bush,**
    State of the Union Address
    January 31, 2006

# Role of the Business Community

- *Keeping America Competitive*


- *Building a Nation of Learners*


- *The Knowledge Economy: Is the US Losing its Competitive Edge?*


- *Tapping America's Potential*

# Programme for International Student Assessment (PISA)

- http://www.pisa.oecd.org
- Organization for Economic Cooperation and Development (OECD)
- Policy oriented-determined by needs of governments
- “Literacy”- capacity of 15 year old students to apply knowledge
- Not limited to curricular competencies- lifelong learning
- 49 countries- OECD members + others

# PISA 2003 Problem Solving

- "OECD countries attach great importance to…an overall capability to solve problems in real-life situations…"

- Three types of problems
  - Decision making
  - System analysis and design
  - Trouble shooting
- Three levels of performance
  - Basic problem solvers
  - Reasoning, decision-making problem solvers
  - Reflective, communicative problem solvers

# Problem Solving Example

Figure 1. Map of roads between towns

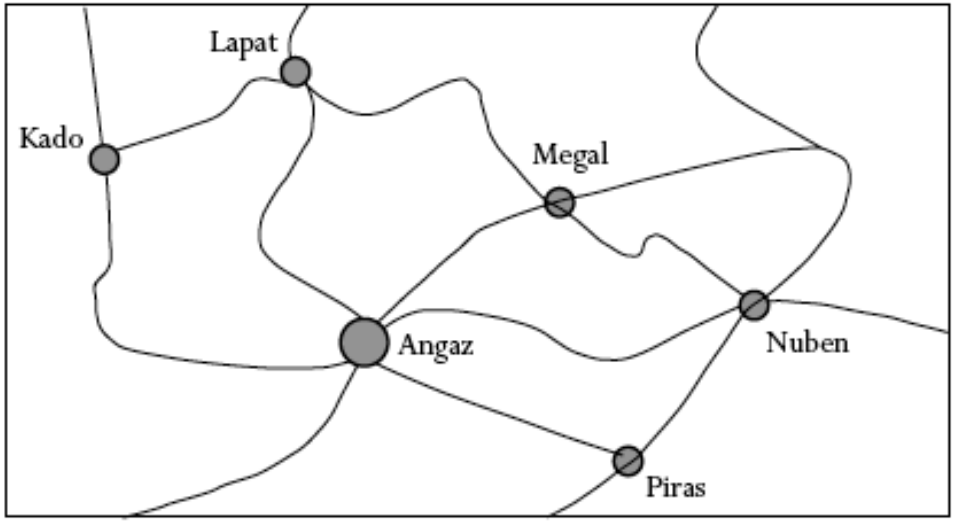



Figure 2. Shortest road distance of towns from each other in kilometres.

| | Angaz | Kado | Lapat | Megal | Nuben | Piras |
|---|---|---|---|---|---|---|
| Angaz | | | | | | |
| Kado | 550 | | | | | |
| Lapat | 500 | 300 | | | | |
| Megal | 300 | 850 | 550 | | | |
| Nuben | 500 | | 1000 | 450 | | |
| Piras | 300 | 850 | 800 | 600 | 250 | |

**HOLIDAY – Question 1**

Calculate the shortest distance by road between Nuben and Kado.

Distance: ..... kilometres.

**HOLIDAY – Question 2**

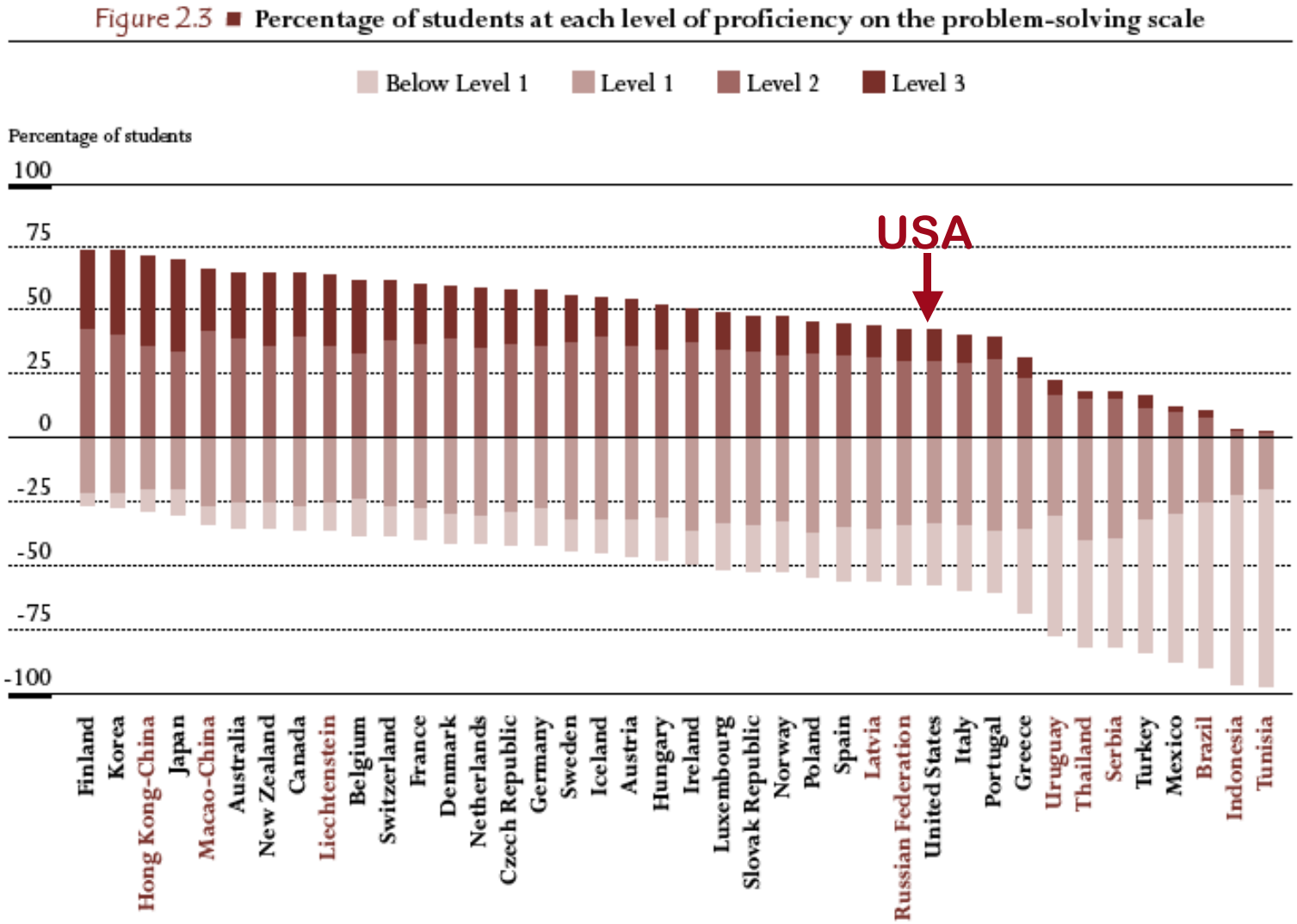
Zoe lives in Angaz. She wants to visit Kado and Lapat. She can only travel **up to 300 kilometres** in any one day, but can break her journey by camping overnight anywhere between towns.

Zoe will stay for two nights in each town, so that she can spend one whole day sightseeing in each town.

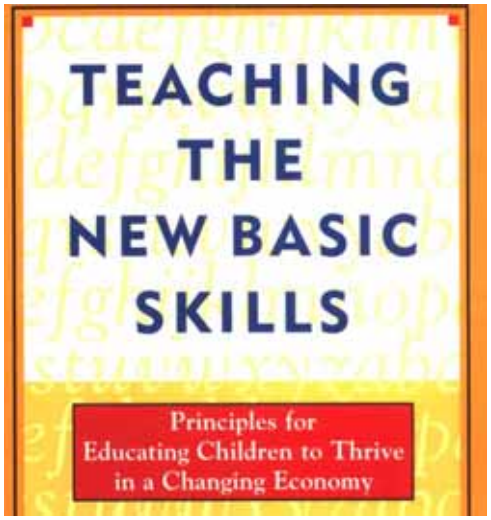
Show Zoe's itinerary by completing the following table to indicate where she stays each night.

| Day | Overnight Stay |
|---|---|
| 1 | Camp-site between Angaz and Kado. |
| 2 | |
| 3 | |
| 4 | |
| 5 | |
| 6 | |
| 7 | Angaz |

# PISA 2003 Problem Solving



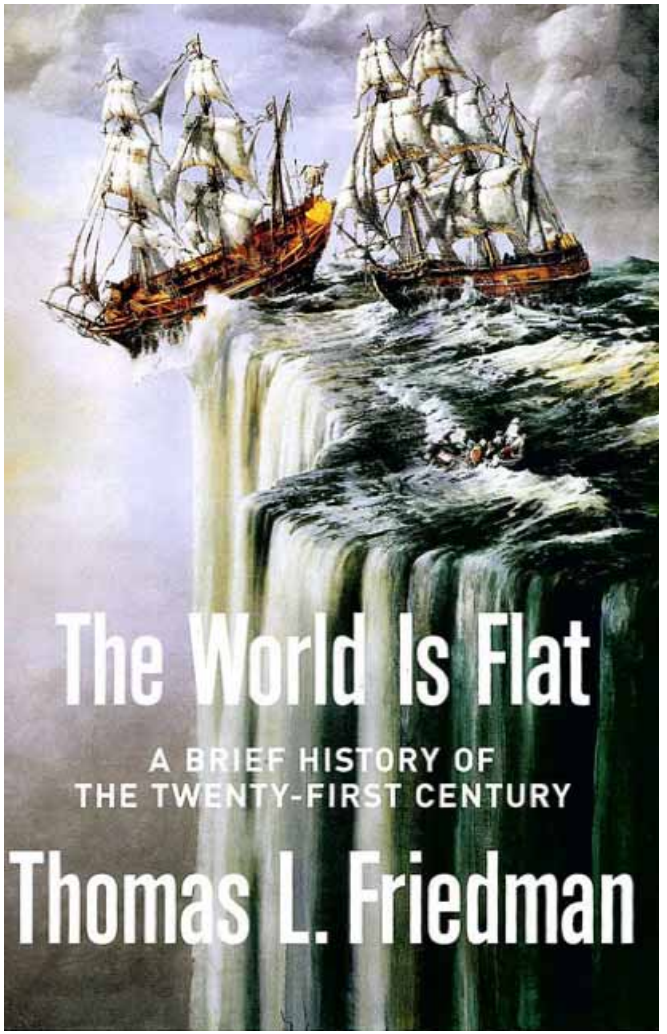
# Teaching the New Basic Skills




- Richard J. Murnane and Frank Levy
- Skills need for a Middle Class Job
  - Read at a 9th grade level
  - Math at a 9th grade level
  - Solve problems where hypotheses required
  - Ability to work in groups with diverse people
  - Ability to communicate effectively, both orally and in writing
  - Ability to use personal computers for basic tasks
- 50% (or more) of students will not get these skills

# The World Is Flat

- A convergence of events & technologies has allowed economic competition to become global
- An education "surplus" in one part of the world can now satisfy education "deficits" elsewhere
- "We must move up the value chain"
- Education is the key

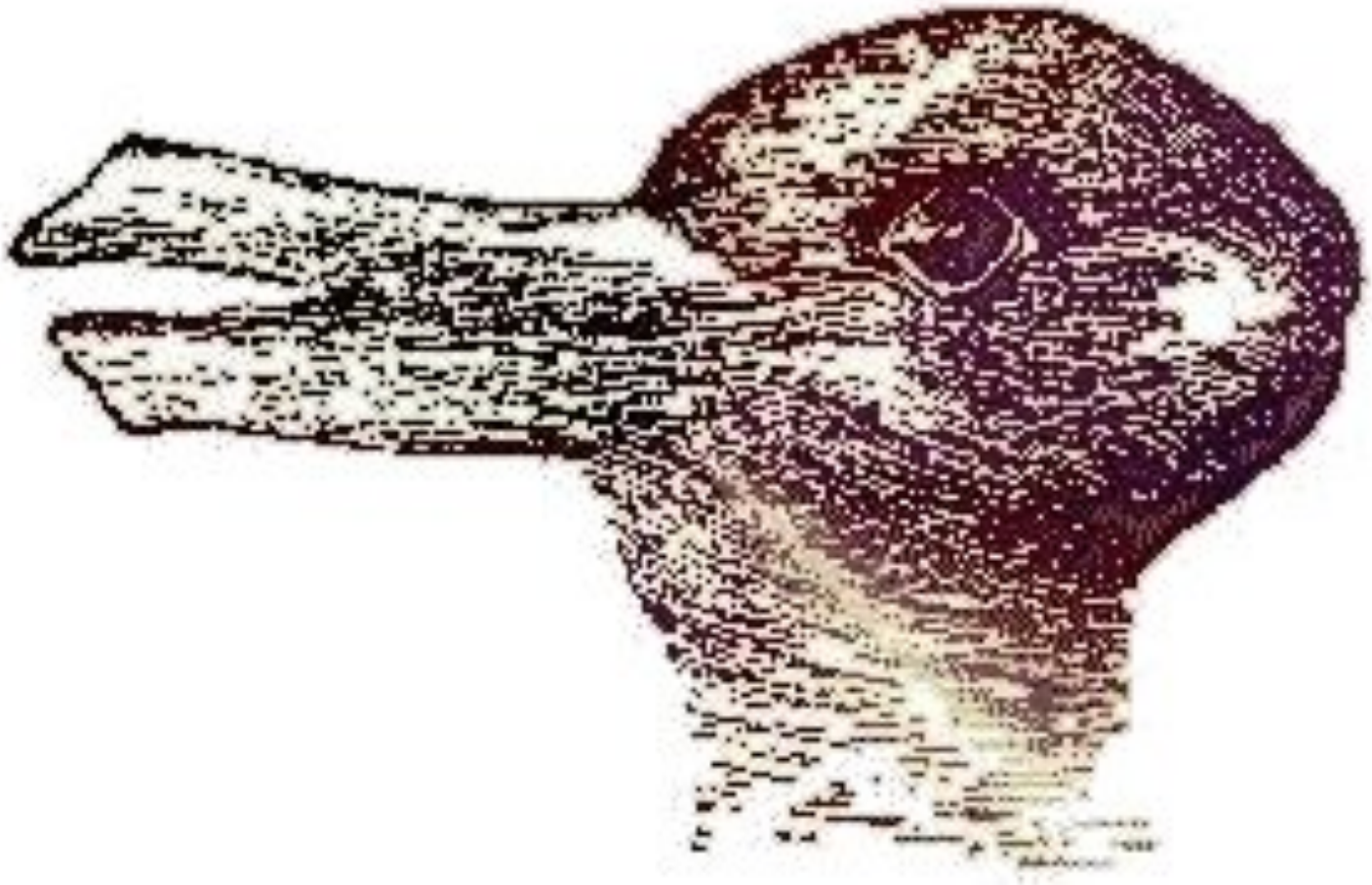
# What Will It Take?

- Leadership
  - Business community, Education community
  - Reform community (NSF, NAS, DOEd, DOD,NSTA, etc.)
  - Political
- A National sense of purpose
  - "A new moon shot"
  - Parents, teachers, students, and citizens prepared for challenge and sacrifice
- Crisis– another Sputnik?
  - Loss of leadership in a major area-- medical tourism?
  - Alternative energies from ??

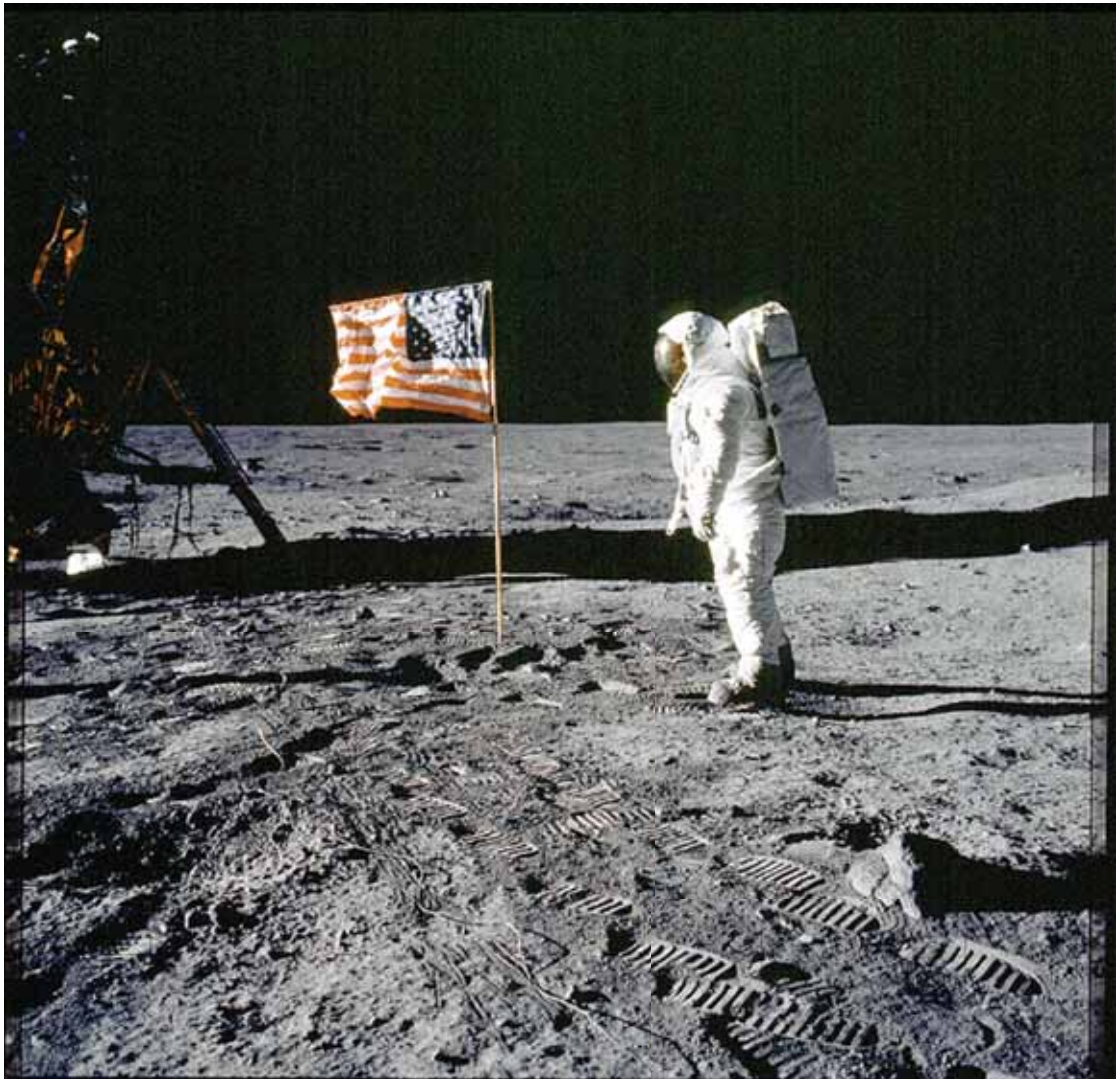
# Paradigm & Paradigm *Shift*

- Ptolemaic cosmology to Copernican cosmology
- Humoral basis of disease to Germ theory
- Newtonian physics to Einsteinian relativity

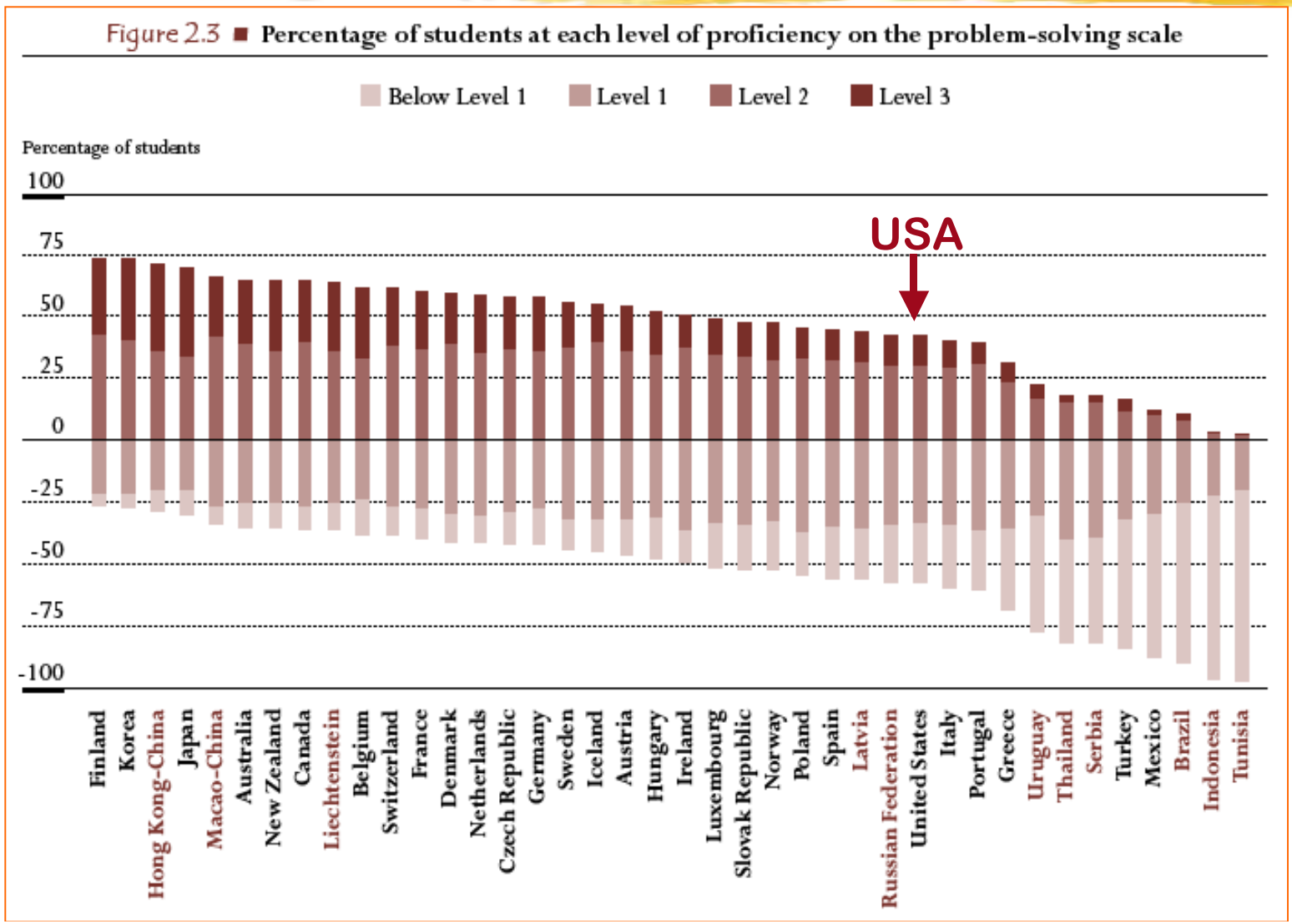
# Paradigm & Paradigm Shift



# What is the Dominant Paradigm?



# New Paradigm



# What Will It Take?

- Truly national science and math standards?
  - Much more rigorous standards (NAEP v. states)
- Differential pay for science & math teachers?

# The Sky is Not Falling…Yet

- USA has many advantages
  - University system
  - Business climate- banks,court system
  - Transparent securities system
  - Strong intellectual property system

- China has many challenges
  - Can they manage through a recession or a bubble economy?
  - Can they establish working courts & I.P. protection?
  - Maintain social stability?
  - Develop truly world-class universities?

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